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REPORT FOR CONSULTATION ON THE VIRGIN ISLANDS AIR QUALITY CONTROL REGION

National Air Pollution Control Administration
Washington, D. C.

March 1970

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REPORT FOR CONSULTATION ON THE

VIRGIN ISLANDS

AIR QUALITY CONTROL REGION

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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
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The Clean Air Act requries the designation of 'air quality control regions' prior to the adoptation of air quality standards and plans for implementation of the standards. A study was thus conducted of the Virgin Islands area.

The results of the study are presented in the report. It consists of a description of the region, an emission inventory, meteorology, and urban factors.

REPORT FOR CONSULTATION ON THE

VIRGIN ISLANDS

AIR QUALITY CONTROL REGION

Details of illustrations in
this document may be better
studied on microfiche.

U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Environmental Health Service
National Air Pollution Control Administration
March 1970

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SECTION I

THE REGIONAL APPROACH TO AIR QUALITY CONTROL AND A FEDERAL PROPOSAL FOR THE VIRGIN ISLANDS AREA

PREFACE

The Secretary, Department of Health, Education, and Welfare, is directed by the Clean Air Act, as amended, to designate "air quality control regions" prior to the adoption by the State (territory) of air quality standards and plans for the implementation of the standards. In addition to listing the major factors to be considered in the development of region boundaries, the Act stipulates that the designation of a region be preceded by consultation with appropriate State (territory) and local authorities.

The National Air Pollution Control Administration (NAPCA) has established a policy by which States and territories may propose to the Federal Government boundaries for air quality control regions. The Department of Health of the Virgin Islands is the third agency to initiate a proposal for region boundaries under the policy. The Department of Health, with assistance from NAPCA, has conducted a study of the Virgin Islands area, the results of which are presented in the body of this report. The Region boundaries proposed in the report reflect consideration of available and pertinent data; however, the boundaries remain subject to revision suggested by consultation between Federal, State (territory), and local authorities. Formal designation will be withheld pending the outcome of the meeting. This report is intended to serve as the starting point for the consultation.

INTRODUCTION

THE REGIONAL APPROACH

Air pollution in the urban areas of the United States is a regional problem which frequently extends across State and local governmental boundaries. Since air pollution problems are rarely confined to any single municipality or county, successful control requires coordinated planning, standard setting, and enforcement by the several political jurisdictions which share a common problem. At the present, State and local governments across the Nation have only begun to develop a regional approach to air pollution control.

The Clean Air Act, as amended, provides a regional approach which depends upon coordination and cooperation between all levels of government: municipal, county, State (territory), and Federal. To set in motion the machinery for regional air pollution control, the Department of Health, Education, and Welfare first designates air quality control regions, issues air quality criteria, and publishes reports on control techniques. The region designation indicates which jurisdictions will be involved in a regional air pollution control effort. The air quality criteria indicate the extent to which various concentrations of an air pollutant are harmful to health and damaging to property. The reports on control techniques provide information on the costs and effectiveness of various techniques for controlling air pollutant emissions.

After the Department of Health, Education, and Welfare completes these initial steps, State (territory) governments develop air quality standards and plans for implementation of those standards for portions of air quality control regions within their boundaries. An air quality standard defines the desired limit on the concentration of a pollutant in the ambient air of the region. It constitutes the degree of air quality which the regional control program will attempt to achieve. An implementation plan is a blueprint of the steps which will be taken to insure achievement of the air quality standards within a reasonable time. The Governors have 90 days to submit letters indicating that they intend to set standards, 180 days in addition to set the standards, and 180 days further to develop plans for implementing them. The procedure for setting standards includes a public hearing which allows residents of a region to express their views concerning desired standards.

The Department of Health, Education, and Welfare reviews air quality standards and implementation plans in order to ascertain their consistency with the provisions of the Clean Air Act, as amended.

When air quality standards and implementation plans are approved, the State (territory) proceeds to prevent and control air pollution in accordance with those standards and plans. This system for establishing a regional approach to air pollution control is depicted in the flow diagram in Figure 1.

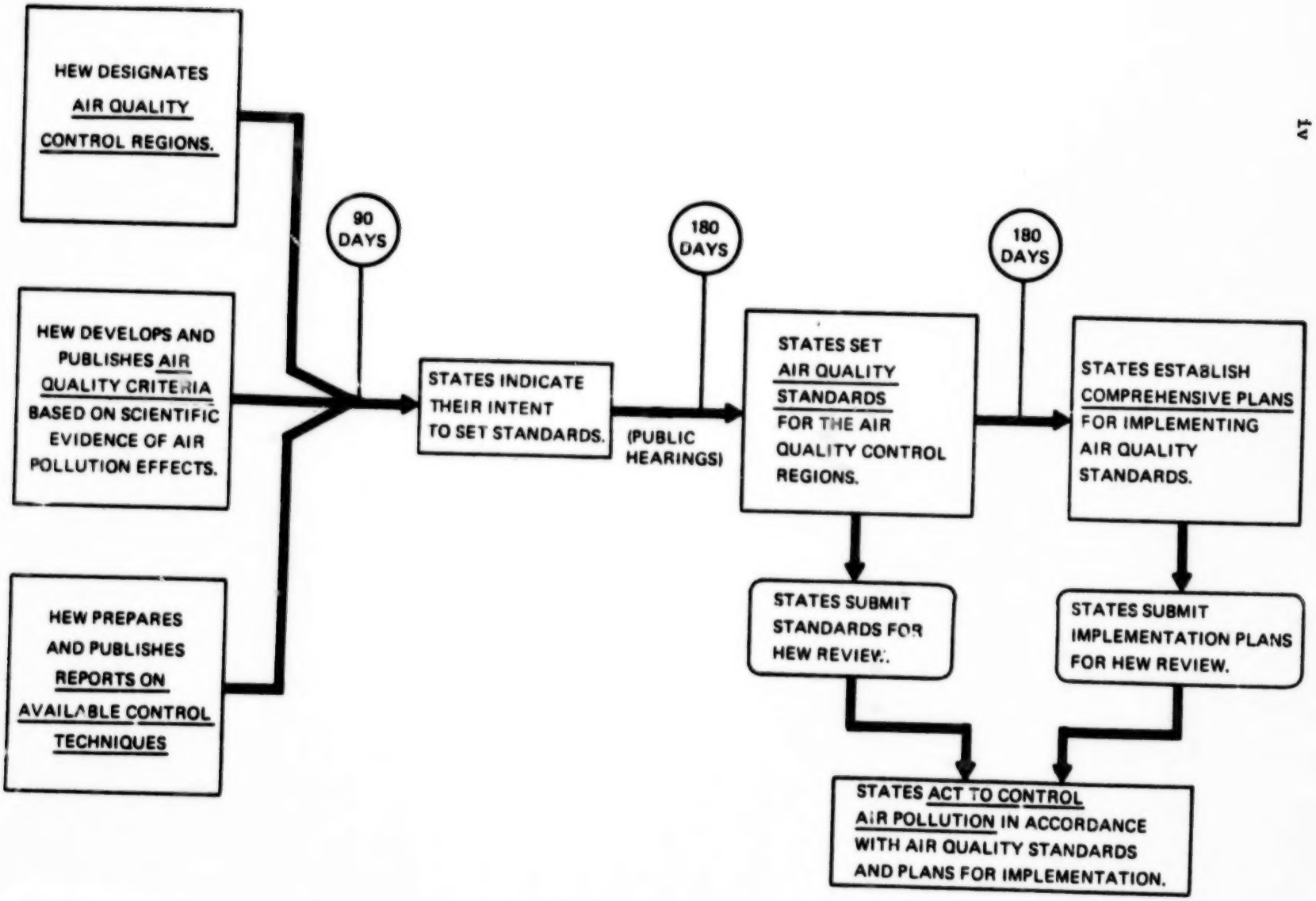
HEW DESIGNATES AIR QUALITY CONTROL REGIONS.
HEW DEVELOPS AND PUBLISHES AIR QUALITY CRITERIA BASED ON SCIENTIFIC EVIDENCE OF AIR POLLUTION EFFECTS.
HEW PREPARES AND PUBLISHES REPORTS ON AVAILABLE CONTROL TECHNIQUES
90 DAYS
STATES INDICATE THEIR INTENT TO SET STANDARDS.
180 DAYS
(PUBLIC HEARINGS)
STATES SET AIR QUALITY STANDARDS FOR THE AIR QUALITY CONTROL REGIONS.
180 DAYS
STATES ESTABLISH COMPREHENSIVE PLANS FOR IMPLEMENTING AIR QUALITY STANDARDS.
STATES SUBMIT STANDARDS FOR HEW REVIEW.
STATES SUBMIT IMPLEMENTATION PLANS FOR HEW REVIEW.
STATES ACT TO CONTROL AIR POLLUTION IN ACCORDANCE WITH AIR QUALITY STANDARDS AND PLANS FOR IMPLEMENTATION.

Figure 1 FLOW DIAGRAM FOR ACTION TO CONTROL AIR POLLUTION ON A REGIONAL BASIS, UNDER THE AIR QUALITY ACT.

DESIGNATION OF AIR QUALITY CONTROL REGIONS

Designation of an air quality control region is one of the first steps in the regional approach to air pollution control. Section 107(a)(2) of the Clean Air Act, as amended, directs the Secretary, Department of Health, Education, and Welfare to make such designations. The portions of the section relevant to this discussion state:

> "...The Secretary, after consultation with appropriate State and local authorities shall... designate air quality control regions based on jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards. The Secretary may...revise the designation of such regions...The Secretary shall immediately notify the Governor or Governors of the affected State or States of such designation."

The Size of a Region

As stipulated in Section 107(a)(2), the designation of air quality control regions should be based on "jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas necessary to provide adequate implementation of air quality standards." This language suggests a number of objectives which are important in determining how large an air quality control region should be. Basically, these objectives can be divided into three separate categories.

First, a region should be self-contained with respect to air pollution sources and receptors. In other words, a region should include most of the important sources in the area as well as most of the people and property affected by those sources.

Unfortunately, since air pollutants can travel long distances, it is impractical if not impossible to delineate regions which are completely self-contained. The air over a region will usually have at least trace amounts of pollutants from external sources. During episodic conditions, such contributions from external sources may even reach significant levels. Conversely, air pollution generated within a region and transported out of it can affect external receptors to some degree. It would be impractical and inefficient to make all air quality control regions large enough to encompass these low-level trace effects. The geographic extent of trace effects overestimates the true problem area which should be the focus of air pollution control efforts. Thus, the first objective, that a region be self-contained, becomes a question of relative magnitude and frequency. The dividing line between "important influence" and "trace effect" will be a matter of judgment. The judgment should be based on estimates of the impact a source has upon a region and the level of pollution to which receptors are subjected. In this respect, annual and seasonal data on pollutant emissions and ambient air concentrations are a better measure of relative influence than short-term data on episodic conditions.

The second general objective requires that region boundaries be designed to meet not only present conditions but also future conditions. In other words, the region should include areas where industrial and residential expansion are likely to create air

pollution problems in the foreseeable future. This objective requires careful consideration of existing metropolitan development plans, expected population growth, and projected industrial expansion. Such considerations should result in the designation of regions which will contain the sources and receptors of regional air pollution for a number of years to come. Of course, region boundaries need not be permanently fixed, once designated. Boundaries should be reviewed periodically and altered when changing conditions warrant readjustment.

The third objective is that region boundaries should be compatible with and even foster unified and cooperative governmental administration of the air resource throughout the region. Air pollution is a regional problem which often extends across several municipal, county, and even State boundaries. Clearly, the collaboration of several governmental jurisdictions is prerequisite to the solution of the problem. Therefore, the region should be delineated in a way which encourages regional cooperation among the various governmental bodies involved in air pollution control. In this regard, the existing pattern of governmental cooperation on the whole range of urban problems may become an important consideration. Certainly the pattern of cooperation among existing air pollution control programs is a relative factor. In general, administrative considerations dictate that governmental jurisdictions should not be divided. Although it would be impractical to preserve State jurisdictions undivided, usually it is possible to preserve the unity of county governments by including or excluding them in

their entirety. Occasionally, even this would be impractical due to a county's large size, wide variation in level of development, or striking topographical features.

To the extent that any two of the above three objectives lead to incompatible conclusions concerning region boundaries, the region must represent a reasonable compromise. A region should represent the best way of satisfying the three objectives simultaneously.

Procedure for Designation of Regions

Figure 2 summarizes the procedure used by the National Air Pollution Control Administration for designating air quality control regions whose boundaries are proposed by the State.

A preliminary delineation of the region is developed by bringing together two essentially separate studies--the "Evaluation of Engineering Factors" and the "Evaluation of Urban Factors."

The study of "Engineering Factors" indicates the location of pollution sources and the geographic extent of serious pollutant concentrations in the ambient air. Pollution sources are located by an inventory of emissions from automobiles, industrial activities, space heating, waste disposal, and other pollution generators. Pollution concentrations in the ambient air are estimated from air quality sampling data and from a theoretical diffusion model.* When

*A diffusion model analysis of air quality in the Virgin Islands will be made in the Spring, 1970. The results will be made available upon request.

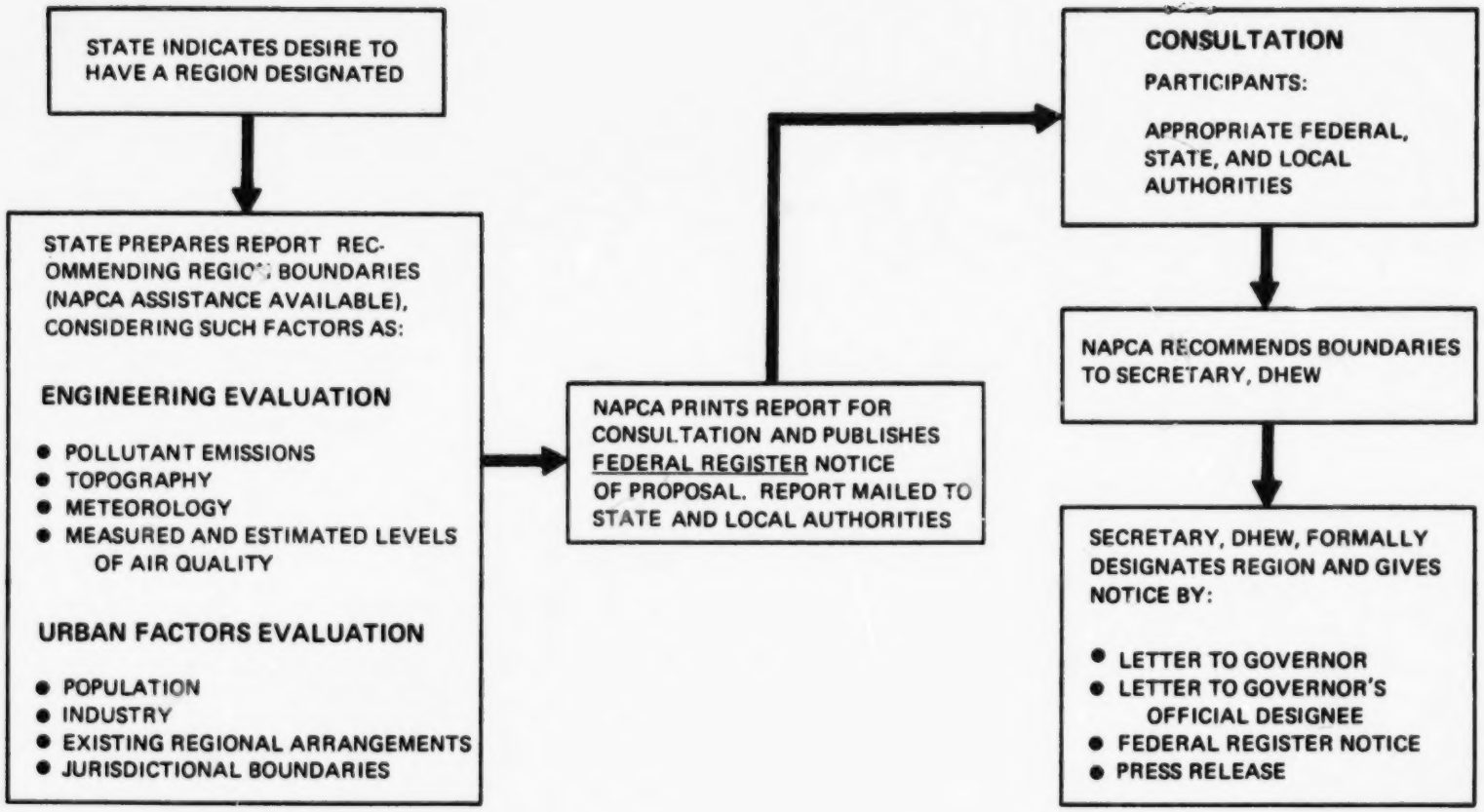
STATE INDICATES DESIRE TO HAVE A REGION DESIGNATED
STATE PREPARES REPORT RECOMMENDING REGIONAL BOUNDARIES (NAPCA ASSISTANCE AVAILABLE), CONSIDERING SUCH FACTORS AS:
ENGINEERING EVALUATION
POLLUTANT EMISSIONS
TOPOGRAPHY
METEOROLOGY
MEASURED AND ESTIMATED LEVELS OF AIR QUALITY
URBAN FACTORS EVALUATION
POPULATION
INDUSTRY
EXISTING REGIONAL ARRANGEMENTS
JURISDICTIONAL BOUNDARIES
NAPCA PRINTS REPORT FOR CONSULTATION AND PUBLISHES FEDERAL REGISTER NOTICE OF PROPOSAL. REPORT MAILED TO STATE AND LOCAL AUTHORITIES
CONSULTATION
PARTICIPANTS:
APPROPRIATE FEDERAL, STATE, AND LOCAL AUTHORITIES
NAPCA RECOMMENDS BOUNDARIES TO SECRETARY, DHEW
SECRETARY, DHEW, FORMALLY DESIGNATES REGION AND GIVES NOTICE BY:
LETTER TO GOVERNOR
LETTER TO GOVERNOR'S OFFICIAL DESIGNEE
FEDERAL REGISTER NOTICE
PRESS RELEASE

Figure 2 FLOW DIAGRAM FOR STATE-INITIATED AIR QUALITY CONTROL REGIONS.

it exists, air quality sampling data is more reliable than the theoretical diffusion model results since the data is directly recorded by pollution measuring instruments. Unfortunately, in many cases extensive air quality sampling data is unavailable in the rural areas surrounding an urban complex.

The study of "Urban Factors" encompasses non-engineering considerations. It reviews existing governmental jurisdictions, current air pollution control programs, present concentrations of population and industry, and expected patterns of urban growth. Other non-engineering factors are discussed when they are relevant. As a whole, the study of urban factors indicates how large an air quality control region must be in order to encompass expected growth of pollution sources in the future. It also considers which group of governmental jurisdictions will most effectively administer a strong regional air quality control region program.

The conclusions of the engineering study are combined with the results of the urban factors study to form the basis of an initial proposal for an air quality control region. As shown in Figure 2, the proposal is then submitted to NAPCA for review and printing.

The report is mailed to State (territory) and local authorities in preparation for the consultation between appropriate Federal, State, and local officials. After reviewing the suggestions raised during the consultation, the Secretary formally designates the region with a notice in the Federal Register and notifies the Governor(s) of the State(s) affected by the designation.

Section II of this report and the proposal therein were prepared by the Department of Health of the Virgin Islands. The report itself is intended to serve as the background document for the formal consultation.

THE FEDERAL PROPOSAL

The National Air Pollution Control Administration has reviewed the proposal and supportive discussion prepared by the Department of Health of the Virgin Islands. NAPCA concurs with the findings of the Department and proposes an air quality control region consisting of the entire United States Virgin Islands, viz., St. Thomas, St. Croix, and St. John, and the smaller islands surrounding these three main islands.

The three objectives outlined in the subsection entitled "The Size of A Region" are met by the proposed delineation. Since the entire jurisdictional area of the Virgin Islands is proposed, all of the sources and receptors would be located in one region. Most of the people reside on two of the three islands--St. Croix and St. Thomas. These islands in addition contain most of the air pollution sources. Though St. John is primarily a National Park area, the island is recommended for inclusion to protect it from sources which might locate there or on the other two islands in the future.

The third objective, that the region boundaries be compatible with unified and cooperative governmental administration, can be best met by including the U. S. Virgin Islands in its entirety. The executive power is vested with one Governor under the supervision of the U. S. Secretary of Interior. The legislature is composed of of elected representatives from all three major islands.

The proposed Region is considered to be one which will be capable of maintaining and, hopefully, improving the air quality of the United States Virgin Islands.

SECTION II

ANALYSIS AND PROPOSAL FOR THE UNITED STATES VIRGIN ISLANDS AIR QUALITY CONTROL REGION

Government of the Virgin Islands

Virgin Islands Department of Health

Division of Environmental Health

St. Thomas V.I.

February 1970

XIV

DESCRIPTION OF THE REGION

The U. S. Virgin Islands lie approximately 1440 miles south southeast of New York and 900 miles east southeast of Miami between Puerto Rico to the west and the British Virgin Islands to the east. Of volcanic origin there are some fifty islands in the group, but since few of the small islands are inhabited, this study applies mainly to the three major islands: St. Thomas, St. John and St. Croix shown in Figure 3a.

St. Thomas, which contains the capital city of the U. S. Virgin Islands, Charlotte Amalie, is 13 miles long and 3½ miles across at the widest point. Its 32 square miles are quite mountainous with peaks rising abruptly from the sea to heights of 1,500 feet. St. John with its major city Cruz Bay is the smallest of the three islands containing only 18 square miles. It is 8½ miles long and 6 miles at the widest point and similar to St. Thomas, quite mountainous with the highest peak reaching 1,277 feet.

St. Croix with its two towns Christiansted and Fredericksted is the largest of the three islands and the eastern most point of the U. S. It is 23 miles long and 7 miles across at the widest point. Unlike her two sister islands most of St. Croix's 87 square miles is level land with a mountainous area running along the northwestern shore.

Figure (3b) illustrates the relative location of one island to the others.

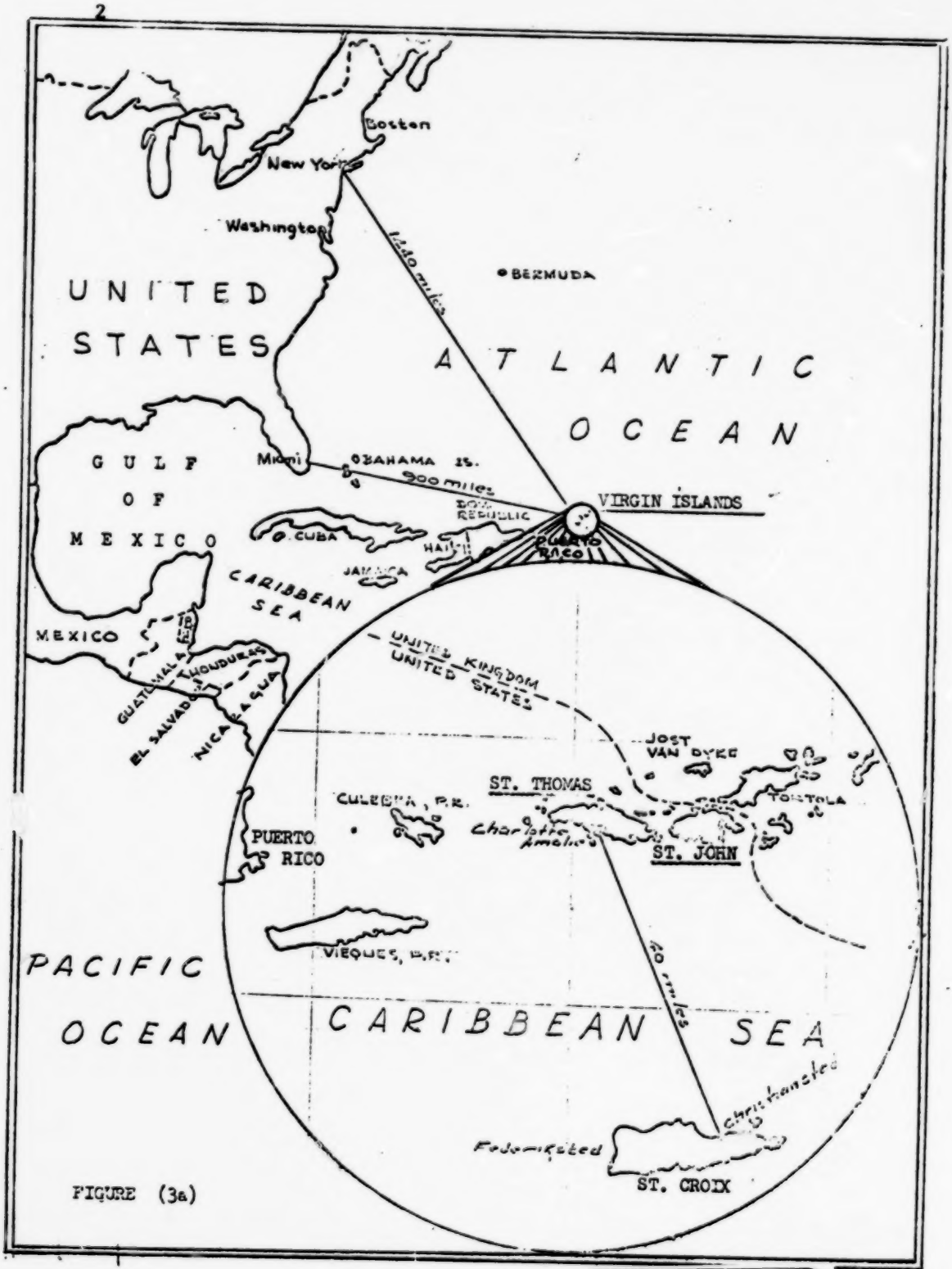

FIGURE (3a)

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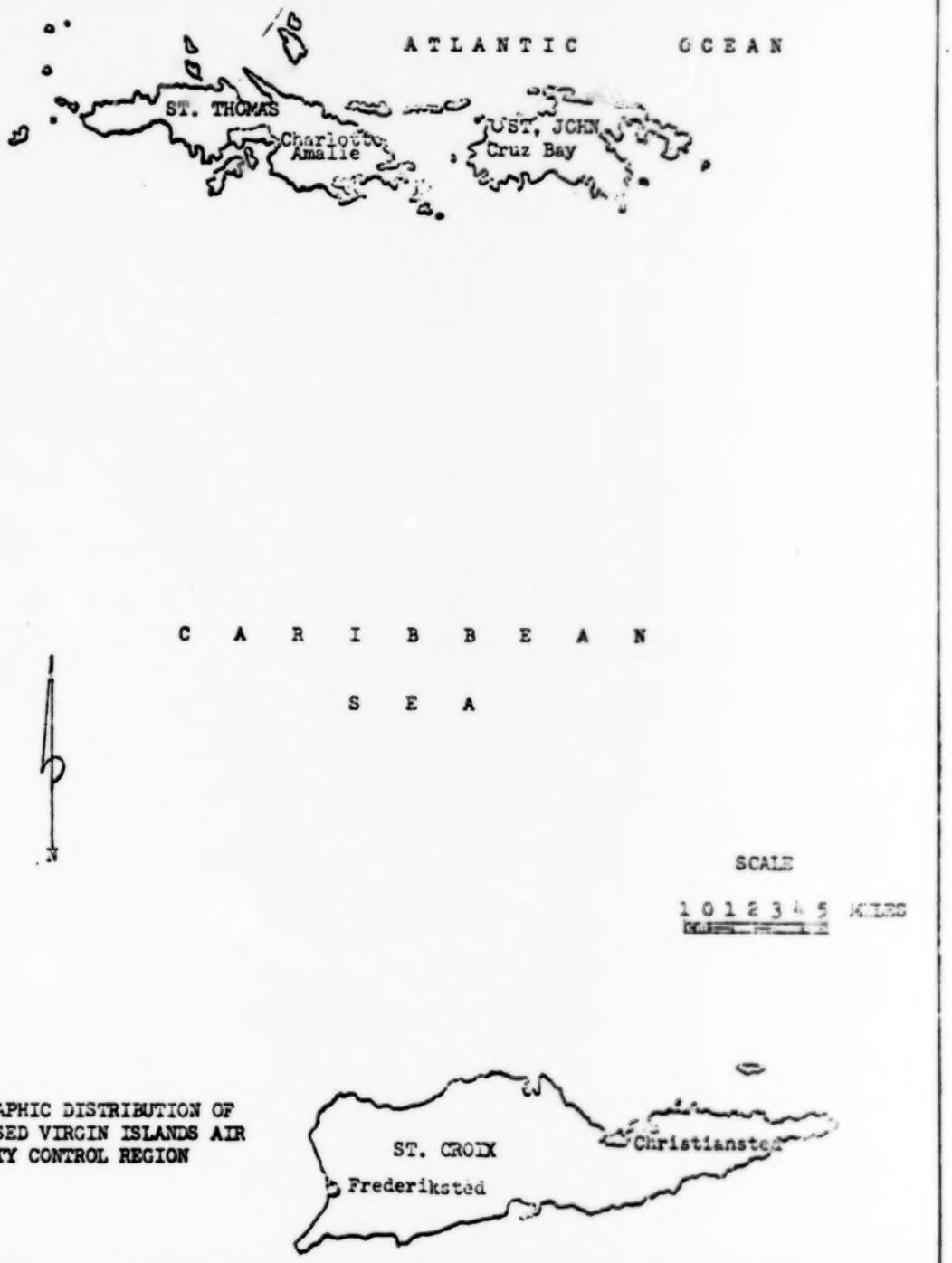

GEOGRAPHIC DISTRIBUTION OF PROPOSED VIRGIN ISLANDS AIR QUALITY CONTROL REGION

FIGURE (3b)

EVALUATION OF ENGINEERING FACTORS

The engineering evaluation for the Virgin Islands area was based on a study of topography, air pollutant emissions, meteorology, and air quality levels. The emission inventory indicated the location of point and area sources and the quantity of pollutants emitted from these sources. Emission densities were calculated for each individual island based on the estimated quantity of each pollutant.

EMISSION INVENTORY

The inventory performed by the Division of Environmental Health was based on estimated rather than measured emissions. Emissions from approximately twenty (20) major point sources are included in the inventory and are identified in Figures (4) (5) and (6).

Five pollutants were inventoried: sulfur oxides, total particulates, carbon monoxide, hydrocarbons, and nitrogen oxides. Sulfur oxides, total particulates and carbon monoxide are considered in this report since they provide an indication of the general geographic extent of the overall problem. Sulfur oxides pollution levels illustrate the impact of fuel burning activities at stationary sources. Levels of carbon monoxide provide the best indication of the impact of gasoline powered motor vehicles on the regional air pollution pattern.

Particulate emissions primarily show the extent of industrial, power, and refuse disposal. Results of the emissions inventory are tabulated in Table (1).

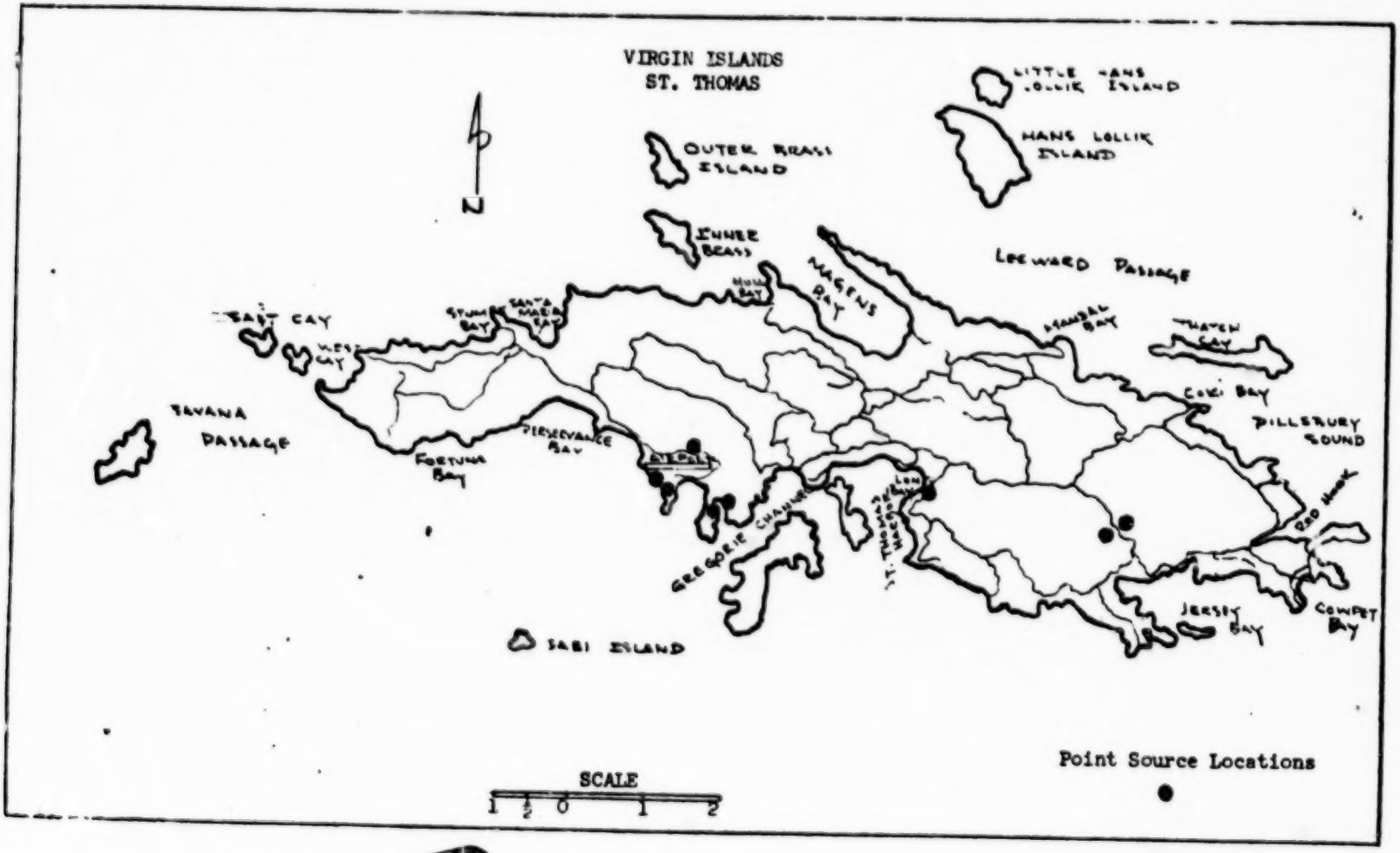

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FIGURE (4)

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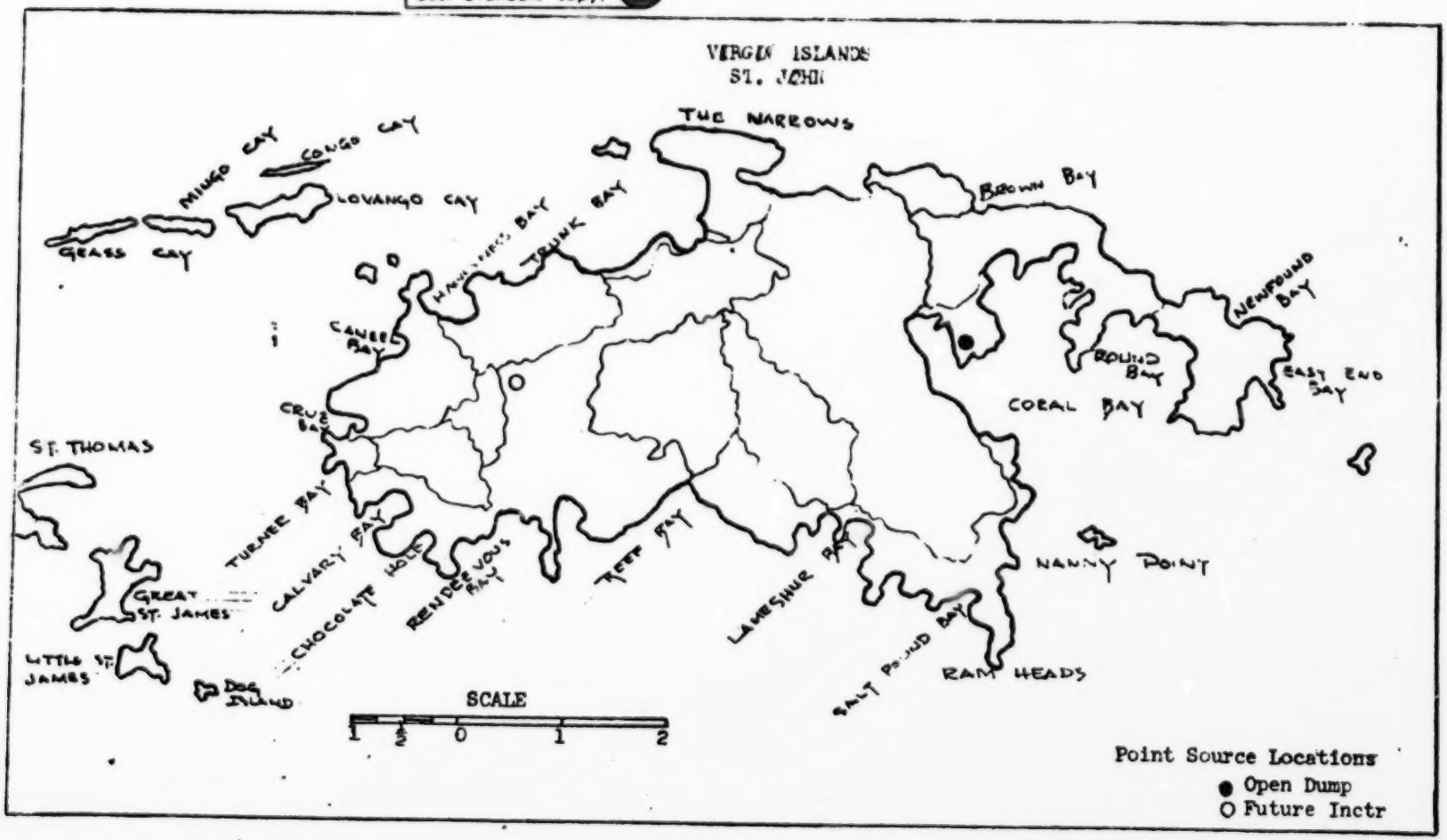


FIGURE (5)

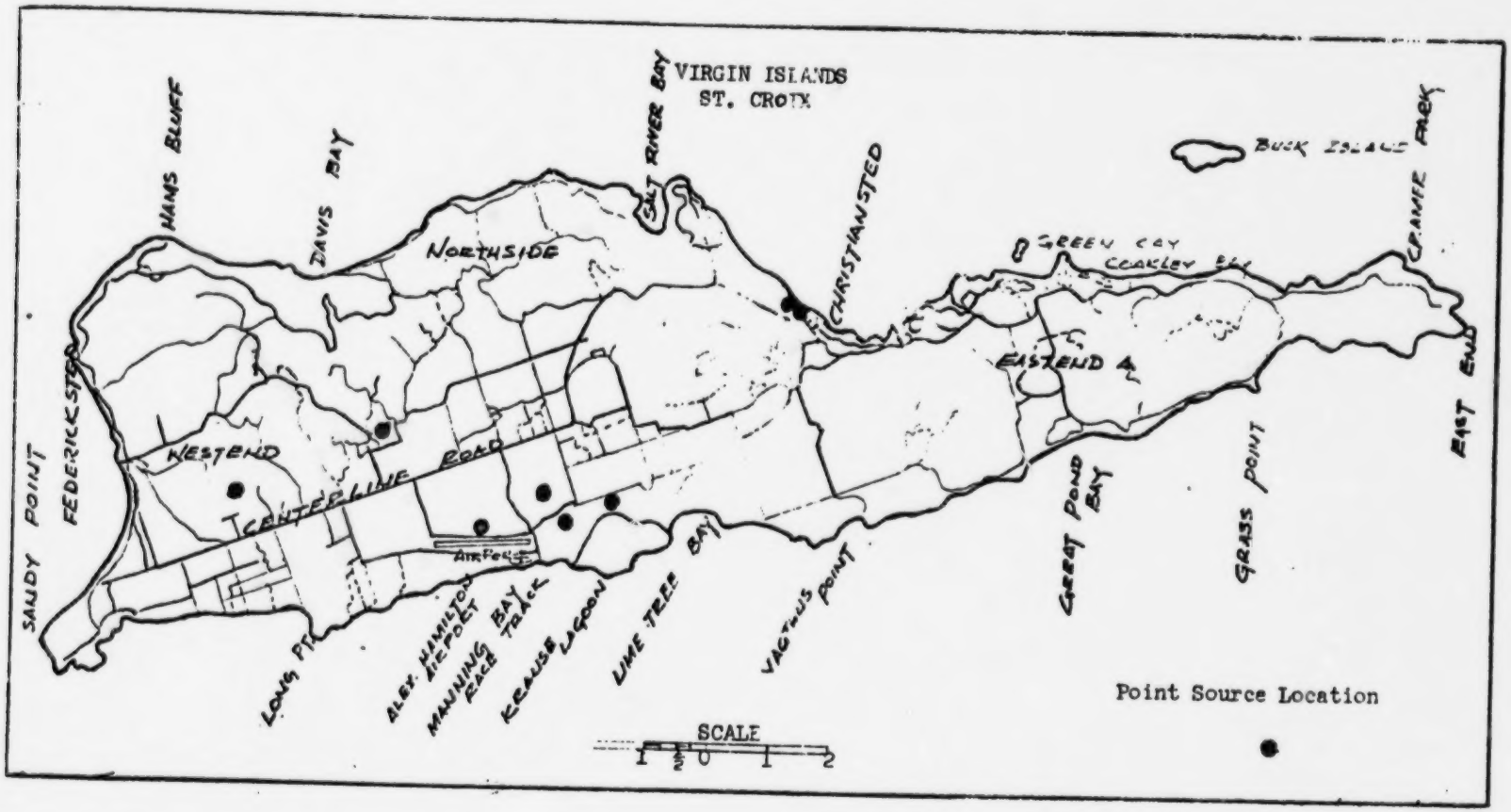

VIRGIN ISLANDS
ST. CROIX
HANS BLUFF
DAVIS BAY
SALT RIVER BAY
NORTHSIDE
CHRISTIANSTED
BUCK ISLAND
CRANIE PARK
GREEN CAY
CRAKLEY BAY
EASTEND
EAST END
SANDY POINT
FREDERICKSTED
WESTEND
CENTERLINE ROAD
AIRPORT
LONG PT.
ALEX. HAMILTON JETPORT
MANNING BAY TRACK
KRAUSE LAGOON
LIME TREE BAY
VAGTHUS POINT
GREAT POND BAY
GRASS POINT
SCALE
1 1/2 0 1 2
Point Source Location

FIGURE (6)

TABLE (1)

SUMMARY OF AIR POLLUTANT EMISSIONS
IN THE VIRGIN ISLANDS BY SOURCE CATEGORY

Source Category / Island	Emissions (Tons per Year)				
	Particulates	Carbon Monoxide	Sulfur Oxides	Nitrogen Oxides	Hydrocarbons
Transportation					
A. Vehicles					
St. Thomas	38	9,959	31	387	1,793
St. Croix	38	10,165	31	395	1,830
St. John	2	517	2	20	93
B. Aircraft					
St. Thomas	46	48	-	32	13
St. Croix	46	48	-	32	13
St. John	-	-	-	-	-
Refuse Disposal					
St. Thomas	1,018	-	26	13	6,064
St. Croix	770	-	20	10	4,586
St. John	43	-	1	0.5	255
Industrial Fuel Combustion					
St. Thomas	60	0.3	2355	780	24
St. Croix	486	2.76	16817	6,184	185
St. John	-	-	-	-	-
Process Emissions					
St. Thomas	60	0.3	2355	780	24
St. Croix					
St. John	-	-	-	-	-
TOTAL	2,607	20,740.4	21,638	8,633.5	14,880

Emissions for the survey were grouped in four general categories. These categories are transportation, refuse disposal, industrial fuel combustion, and industrial process emissions.

For transportation emissions, gasoline sales were assumed to equal total consumption. Sales figures were obtained from the Department of Finance. Aircraft emissions data for Truman and Hamilton Airports (assumed as a point source) was computed using air traffic data.

Solid-waste generation was based on an estimated 6.0 pounds of refuse per capita per day. Open dump burning on all three islands is the sole source of disposal. Each dump was treated as point source.

Stationary source emissions include emissions from point sources only, since there is no space heating in the Virgin Islands. Point sources include power plants and major institutions and industries. Together they account for roughly 95% of the estimated total industrial fuel oil consumption in the survey area. Fuel oil consumption was obtained directly from existing industries.

METEOROLOGY

The meteorological conditions prevalent in this area of the Caribbean are not conducive to strong periods of pollution lasting several days such as occur over the mainland of the United States. The lack of frontal or air mass inversions and generally good wind circulation from the easterly trades, prevent any general long

period pollution conditions. The problem in this area is one of short duration localized situations which may favor pollution build up for a few hours. An example of this is the early morning radiation inversion in conjunction with calm or low speed winds.

Figure (7) shows wind roses for the Virgin Islands, based on the annual averages for the years 1953 to 1957. They represent graphically the frequency of occurrence of the wind from the various compass directions. The characteristic prevailing wind directions for each of the seasons, as depicted by the length of the wind rose radials, directly influence the dispersion of pollutants.

Mixing depths in the Virgin Islands are generally unlimited except during early morning periods of radiation inversion. Reasonable estimates of these mixing depths are cited below:

AVERAGE MIXING DEPTHS (Meters)

	Winter	Spring	Summer	Autumn	Annual
Morning	250	320	335	280	296
Afternoon	1240	1480	1570	1320	1403

VIRGIN ISLANDS WIND ROSE

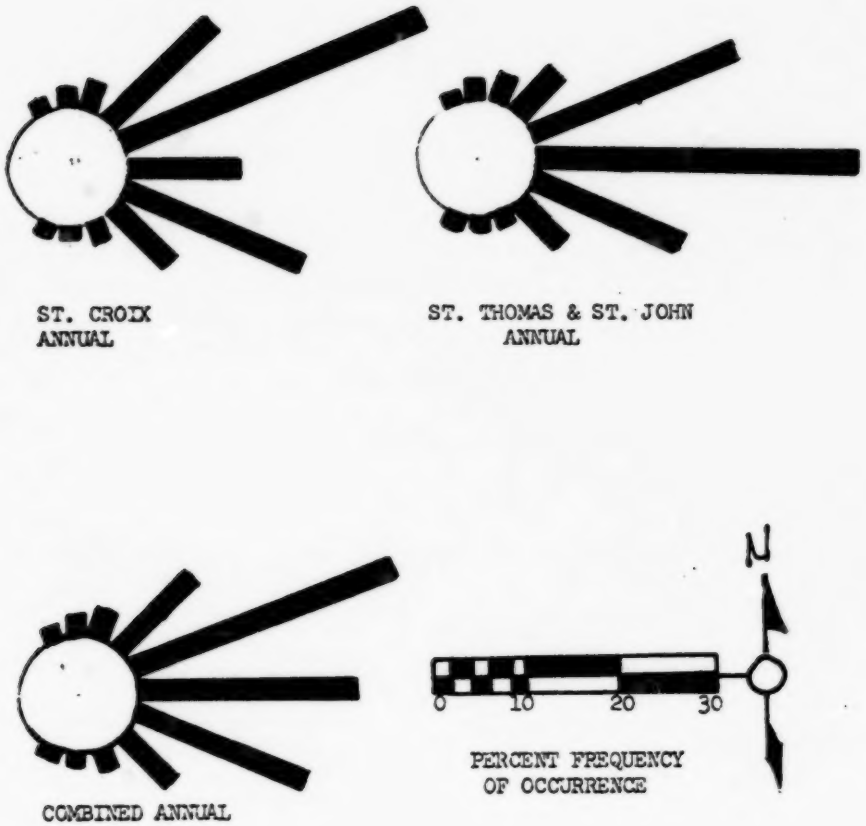


FIGURE (7)

EVALUATION OF URBAN FACTORS

A number of urban factors are relevant to the problem of defining air quality control region boundaries. The location of population is an important consideration since human activity is the ultimate cause of air pollution, and humans are the ultimate victims. The projected population growth pattern is another important consideration, since an air quality control region should be designed not only for the present but also for the future. The location of industrial activity and industrial growth patterns are relevant considerations for similar reasons. Political and jurisdictional considerations are important since the 1967 Air Quality Act envisions regional air pollution programs based on cooperative efforts among many political jurisdictions. The following discussion of urban factors will present these considerations as they apply to the Virgin Islands area.

POPULATION

The 1968 resident population of the Virgin Islands was estimated at 60,321 persons. The distribution of this population throughout the islands is illustrated in Figure (8).

Table (3) shows the historical and projected population of the islands. The trend is illustrated in Figure (9). Between 1930 and 1950 the population increased at a slow rate from 22,012 to 26,665 persons. Between 1950 and 1960 it increased at a faster rate, from 26,665 to 32,099, with the influx of immigrants and alien workers attracted by the expanding tourist industry.

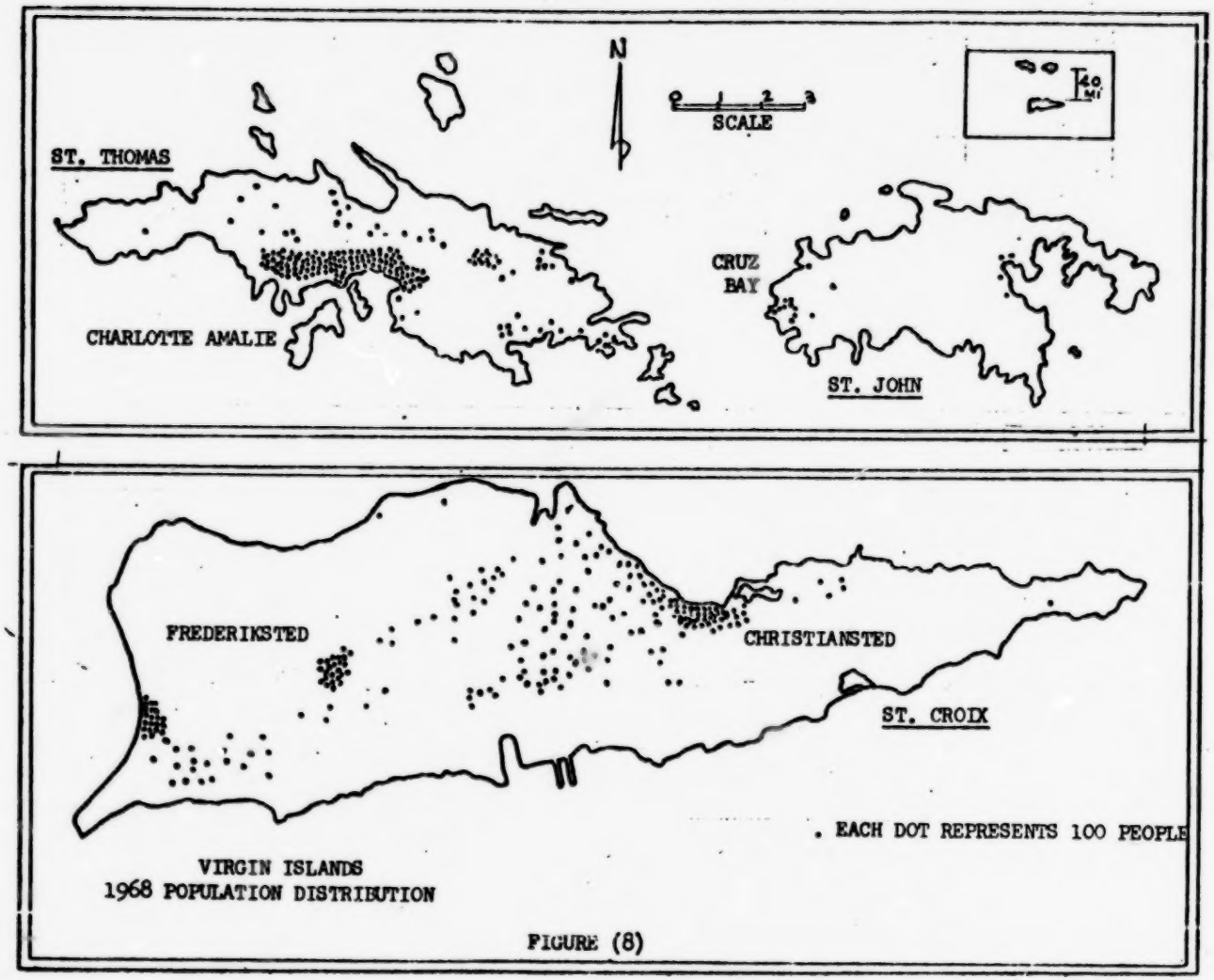

N
SCALE
0 1 2 3
40 MI
ST. THOMAS
CHARLOTTE AMALIE
CRUZ BAY
ST. JOHN
FREDERIKSTED
CHRISTIANSTED
ST. CROIX
. EACH DOT REPRESENTS 100 PEOPLE
VIRGIN ISLANDS
1968 POPULATION DISTRIBUTION

FIGURE (8)

VIRGIN ISLANDS

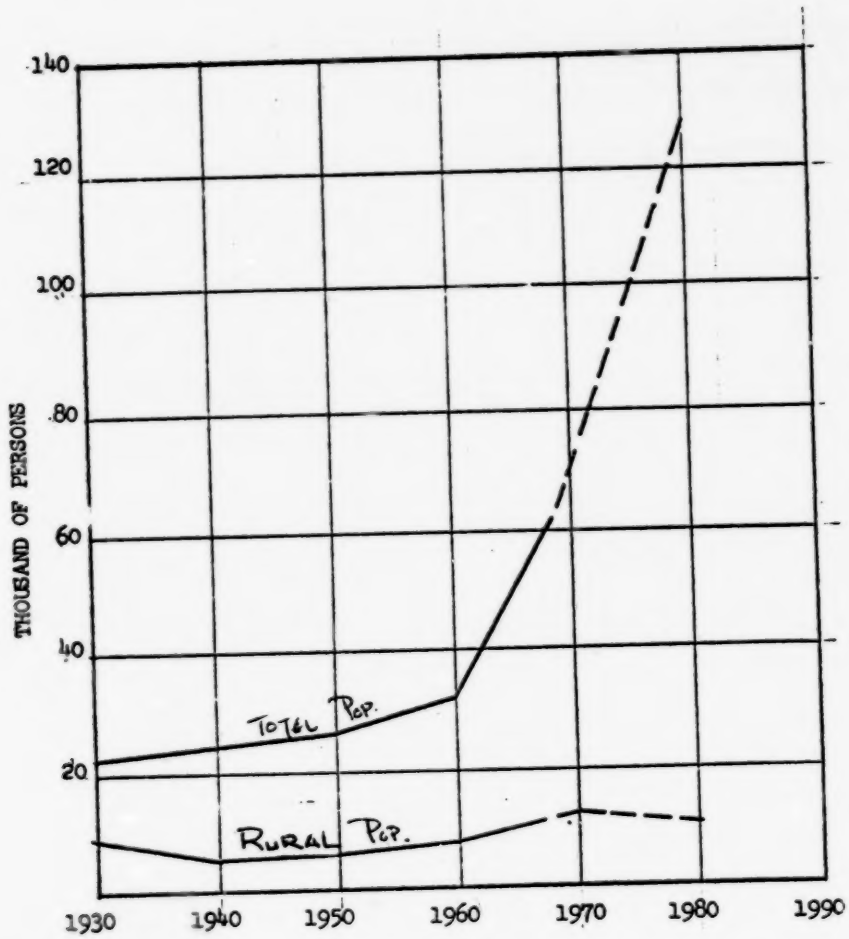
URBAN & RURAL POPULATION

YEAR	RURAL	URBAN	TOTAL
1917	10,386	15,465	26,051
1930	8,511	13,501	22,012
1940	4,931	19,958	24,889
1950	5,851	20,814	26,665
1960	7,953	24,146	32,099
1970	12,000	57,400	69,400
1980	10,800	120,600	131,400

SOURCES: U.S. Bureau of Census, 1917-1960

V.I. Planning Board estimates, 1970-1980

TABLE (3)



TRENDS IN POPULATION
VIRGIN ISLANDS

FIGURE (9)

During the current decade the rate of increase has exploded to where the 1968 population is almost twice what it was in 1960. An even faster rate of increase is anticipated throughout the 1970-80 decade as the spectacular growth of tourism and other economic opportunities continue to attract immigrants, particularly alien workers from the British Virgin Islands, British West Indies and other islands of the Lesser Antilles group. By 1980 the population is expected to reach 131,400 persons, more than double the present population.

Aliens comprised 20% of the total population in 1960 and about 33% in 1968. It has been estimated that by 1975 they will make up about 40% of the total population but will then drop to about 35% by 1980.

Alien workers represent about one-half of the total labor force of 27,000. They are concentrated in the service and construction industries.

In addition to the permanent and part-time residents, the Virgin Islands, and particularly St. Thomas, have a floating population of visitors, over 800,000 in 1968, for which services including adequate local transportation must be provided. About one-half of the total visitors (air and ship) stay for one day or less.

The distribution of the 1968 population and the estimated 1980 population by islands and by rural and urban places is shown in Table (4).

VIRGIN ISLANDS

ESTIMATED DISTRIBUTION OF 1968 AND 1980 POPULATION

		1968	1980
ST. THOMAS			
Urban -	Charlotte Amalie	25,100	40,400
	Tutu	-	19,900
	East End	-	10,600
	Red Hook	-	6,400
	Total Urban	25,100	77,300
Rural	----------	5,976	6,100
Total	----------	31,076	83,400
ST. JOHN			
Urban -	Cruz Bay	9960	2,900
Rural	----------	640	1,900
Total	----------	1,600	4,800
ST. CROIX			
Urban -	Christiansted	9,242	14,100
	Frederiksted	3,334	4,300
	Central	10,922	22,000
	Total Urban	23,498	40,400
Rural	----------	4,147	2,800
Total	----------	27,645	43,200
TOTAL ALL ISLANDS		60,321	131,400

SOURCE: V.I. Planning Board

TABLE (4)

St. Thomas

About one-half of the total V. I. resident population of 1968, 31,076 persons, were located on the 32 square miles of St. Thomas. Thus, St. Thomas with a population density of 971 persons per square mile is the most densely populated of the islands.

Most of the St. Thomas residents, about 80%, are now concentrated in the urbanized area of Charlotte Amalie. The other 20% are scattered throughout the mountains and on the eastern side around Tutu, Red Hook, and East End. These eastern areas, now classified as rural, are rapidly urbanizing.

The major growth in population during the next decade is predicted for St. Thomas because it is the primary center of the tourist industry. The total population is expected to reach 83,400 persons, about 2.7 times the present population, which will increase the density to nearly 3,000 persons per square mile. The eastern side will absorb most of the increase with new urban centers developing at Tutu, Red Hook, and East End.

St. Croix

St. Croix, the largest of the Virgin Islands, had 27,645 inhabitants in 1968 for a population density of 318 persons per square mile, about one-third of the density of St. Thomas. About 33% of the residents of St. Croix live in the city of Christiansted on the north shore. Another 12% live in Fredericksted on the western shore.

By 1980 the population of St. Croix is expected to grow to 43,200 persons, which will increase the density to 497 per square mile. Most of the growth is being channeled to the central St. Croix region because of the industrial development taking place in that area and because it offers the most logical space for urban expansion. Long range plans for this central St. Croix area are under study by the Planning Board.

St. John

St. John with the most rugged topography of the Virgin Islands has only about 1600 inhabitants on its 18 square miles for a density of 89 persons per square mile. Over half of its population is concentrated at Cruz Bay on the west and with another small cluster at Coral Bay in the east.

St. John is the site of the Virgin Islands National Park and about 42% of the land area, over 5,000 acres, are already in Federal ownership under the control of the National Park Service.

Although it is expected that the population of St. John will triple by 1980 this means only an increase to 4800 residents of which 60% will be in the Cruz Bay area. Most of the other 40% will be in the Coral Bay area with only scattered residents throughout the remainder. St. John will remain essentially a park and recreational area.

Table (5) shows the present population and projected population for St. Thomas, St. Croix, and St. John.

TABLE (5)

PRESENT POPULATION AND PROJECTED POPULATION

Islands	Area Mile^2	Population 1968	Population Density 1968 Residents Mile^2	Expected Population 1980	Population Density 1980 Residents/Mile^2	Additional Residents per Mile^2 1968-1980
St. Thomas	32	31,076	971	83,400	2,606	1,635
St. Croix	87	27,645	318	43,200	497	179
St. John	18	1,600	89	4,800	266	177
TOTAL	137	60,321	1,378	131,400	3,369	1,991

Industry

The Island of St. John has virtually no industry. The residents are employed by the local government, the National Park Service, and the 125 Room Cannel Bay hotel.

St. John is 42% National Park and its sources of pollution are restricted to the open dump and 500 registered vehicles.

The Island of St. Thomas has little or no heavy industry. However, there are several point sources, normally those created as a result of the construction industry. These are cement storage and processing and aggregate crushing and storage. Other point sources are shown in Figure (4).

St. Croix is unlike St. Thomas and St. John since there are several major industries. The two largest are an oil company and an alumina company, which employ a total of 810 people. In addition there also exist several small chemical processing companies along with cement and aggregate storage and mixing plants.

Figure (10) shows the location of industry.

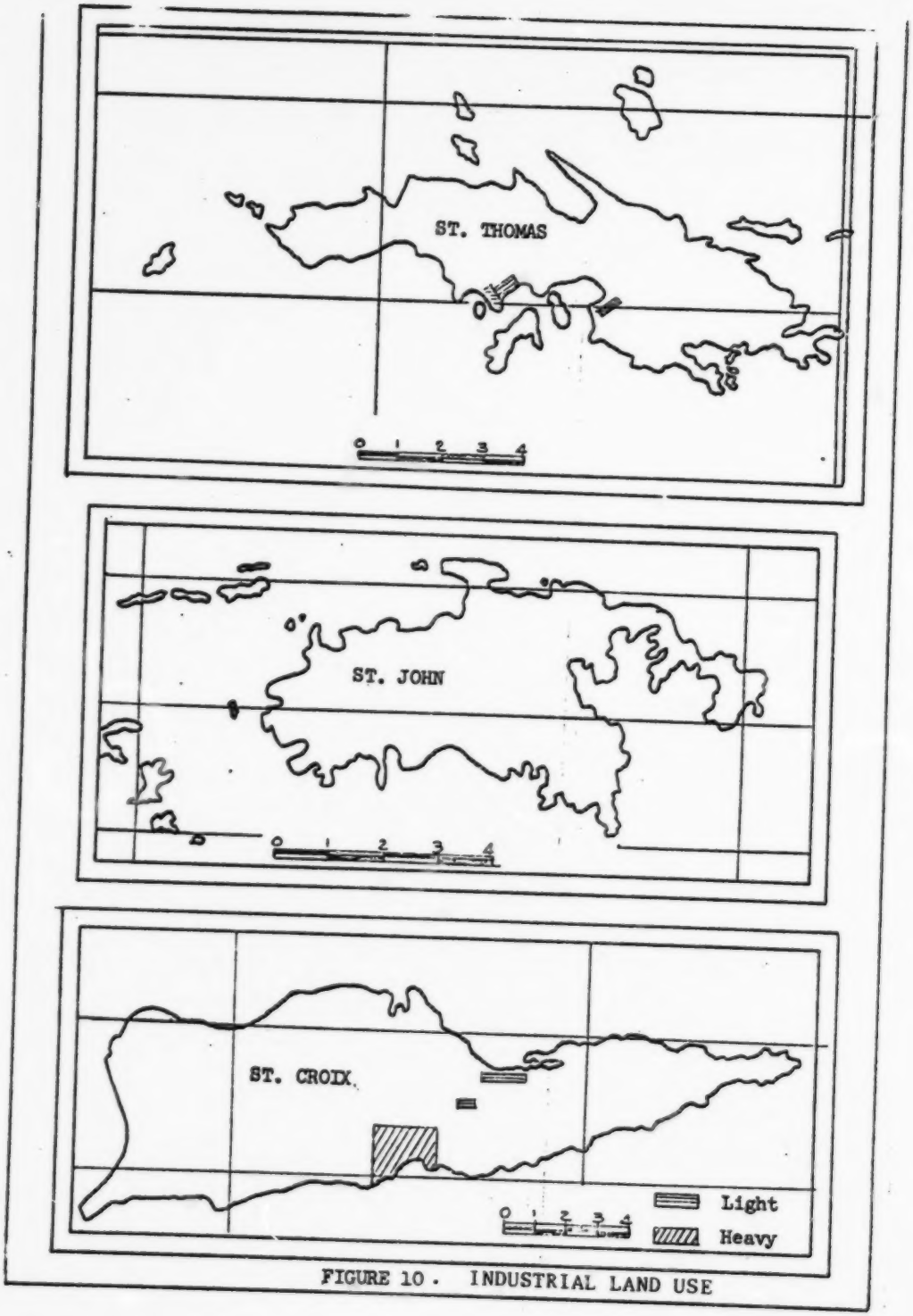


FIGURE 10. INDUSTRIAL LAND USE

THE PROPOSED REGION

Subject to the scheduled consultation, the Virgin Islands Health Department recommends that the Secretary, Department of Health, Education, and Welfare designate The United States Virgin Islands as an air quality control region consisting of the following jurisdictions in the Virgin Islands:

St. Croix, V. I. and surrounding islands
St. John, V. I. and surrounding islands
St. Thomas, V. I. and surrounding islands

As so proposed, the U. S. Virgin Islands Air Quality Control Region would consist of the territorial area encompassed by the outermost boundaries of the proposed jurisdictions. The proposed Region is shown in Figure 3 (b). The proposed jurisdictions are shown in Figures (4), (5), and (6).

DISCUSSION OF PROPOSAL

To be successful, an air quality control region should meet three basic conditions. First, its boundaries should encompass most pollution sources as well as most people and property affected by those sources. Second, the boundaries should encompass those locations where industrial and residential development will create significant air pollution problems in the future. Third, the boundaries should be chosen in a way which is compatible with and even fosters unified and cooperative governmental administration of the air resources throughout the region.

The proposed region of the U. S. Virgin Islands, which contains all of the population and industry on the islands and which is governed exclusively by the government of the Virgin Islands, satisfies these three objectives.

For the present, no major air pollution conditions exist in the overall region. These conditions are enhanced by the fact that, constant ventillation of the area is assured because the islands lie in the path of the easterly trade winds. Furthermore the tropical climate eliminates the necessity of space heating, a major contributing factor to air pollution problems in most northern cities several months out of a year.

Although the likelihood of an air pollution episode occurring in this region is rather slim, localized air pollution does exist. People and industry have been coming to the Virgin Islands and with them the necessity for more power and transportation is rapidly increasing. Eventually the population boom will become too excessive to allow for logical land use and residential areas will be placed against industrial sites.

The pollution hazards experienced by people living next door to oil refineries, petro-chemical plants, power plants, simple cement batching plants etc., will be as real as any that exist in the industrial metropolitan areas on the mainland.

It is essential then, that steps be taken <u>now</u> to establish emission levels and air quality standards; and enforce pollution controls in order to offset this rapidly approaching menace.

REFERENCES

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2. Public Health Service. Compilation of Air Pollutant Emission Factors. Publication No. 999-AP-42, Environmental Health Series, U. S. DHEW, National Center for Air Pollution Control, Durham, North Carolina.

APPENDIX

POLLUTANT EMISSION SOURCES IN THE VIRGIN ISLANDS

Sources	St. Thomas	St. John	St. Croix
A. METALLURGICAL EQUIPMENT			
1. Aluminum Manufacturing Processes			1
B. MECHANICAL EQUIPMENT			
1. Concrete-Batching Plants	6		4
2. Rock & Gravel Aggregate Plants	3		2
3. Cement-Handling Equipment	1		1
4. Rubber - Compounding Equipment	1		
5. Dry Cleaning Equipment	3		4
C. INCINERATION			
1. General - Refuse Incinerators	1	1	1
D. COMBUSTION EQUIPMENT			
1. Gaseous and Liquid Fuels	4	1	5
2. Gas and Oil Burners			1
3. Boilers, Heaters, and Steam Generators	3	1	5
E. PETROLEUM EQUIPMENT			
1. Storage Vessels	2		3
2. Loading Facilities			1
3. Cooling Towers	1		3
4. Catalyst Regeneration			2
5. Oil - Water Effluent Systems			1
F. CHEMICAL PROCESSION EQUIPMENT 27			
1. Soaps & Synthetic Detergents			2